The Birthday Problem and Complementary Events (Sect. 8.6) NAMES:

These are selected questions (numbers copied from book) from Set II of the exercise set. Turn in one paper per group but be sure all members of the group have seen the final answers. Circle your name if the paper that gets turned in is your copy.

The Arthur Murray Dance Studios once offered $25 worth of dancing lessons to anyone who had a "lucky dollar." A "lucky dollar" was a bill whose serial number included a 2, 5, or 7. If you have any dollar bills with you, check to see whether or not you would have been a winner.

1. The probability that any given digit is a lucky one is $\frac{3}{10}$. Explain.

2. What is the probability that any given digit is *not* a lucky one?

There are eight digits in the serial number of a dollar bill.

3. Show why the probability that all eight digits will *not* be lucky ones is about 6%.

4. What is the probability that at least one of the digits in the serial number is a lucky one? [This is the complementary event to the probability found in #3.]

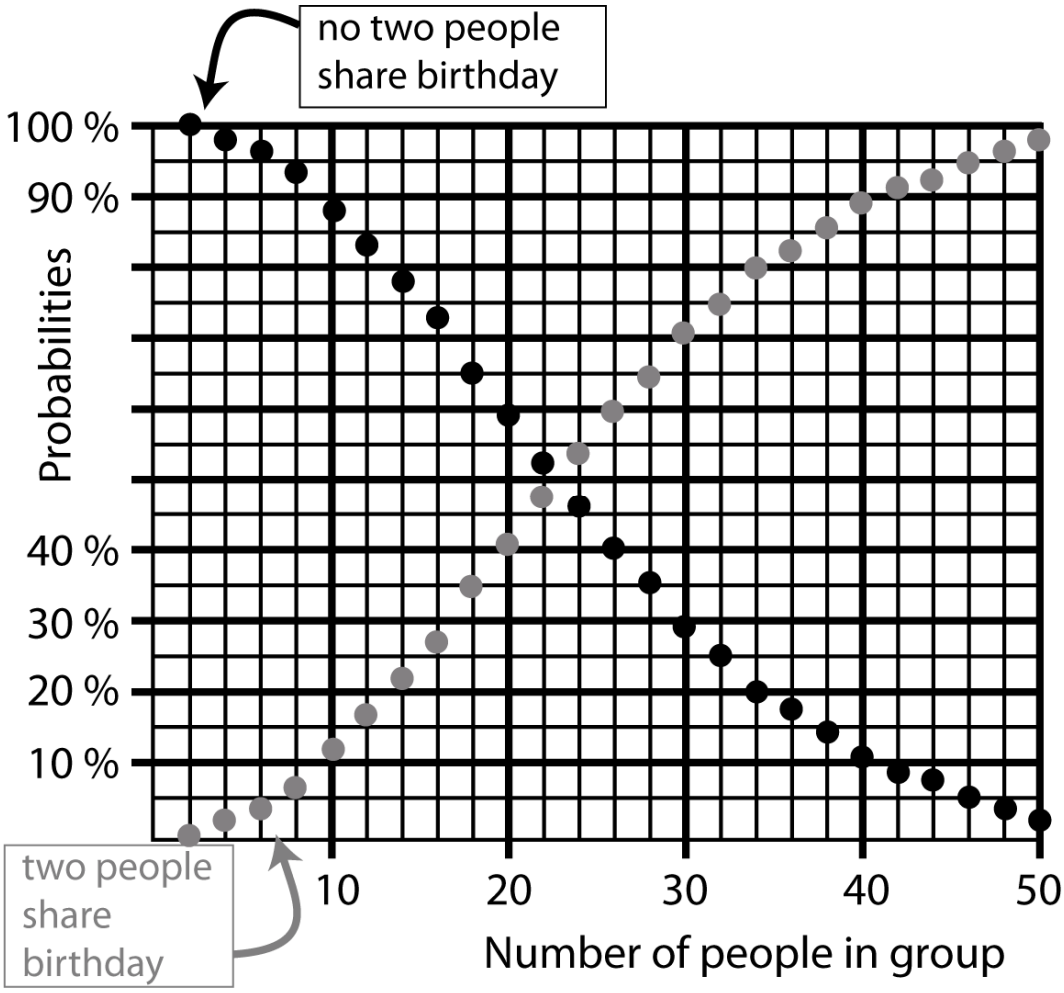
5. Out of 100 people with dollar bills, how many would you expect to be winners?

6. Why do you suppose the Arthur Murray Dance Studios made this offer?

The probabilities that there are two people in a group who share the same birthday and that no two people do are shown below. *Each is rounded to the nearest percent.*

Number of people in group	**Probability that all birthdays are different**	**Probability that there are two people who share the same birthday**
2	100%	0%
4	98%	2%
6	96%	4%
8	93%	7%
10	88%	12%
12	83%	17%
14	78%	22%
16	72%	28%
18	65%	35%
20	59%	41%
22	52%	48%
24	46%	54%
26	40%	60%
28	35%	65%
30	29%	71%
32	25%	75%
34	20%	80%
36	17%	83%
38	14%	86%
40	11%	89%
42	9%	91%
44	7%	93%
46	5%	95%
48	4%	96%
50	3%	97%

7. [The information from the table is graphed below. The graph shows the number of people in the group on the *x*-axis and the probabilities on the *y*-axis. Try to find a few values from the table on the graph to help you understand the graph.]



8. How does [the] graph support the answer “23 people” that was given for the “coinciding birthdays” problem? [Remember this asks for the smallest number of people in a group so that the odds favor two people having the same birthday.]

[9. How many people would have to be in the room for you to bet that two people would share a birthday? Explain.]

[10. Let’s explore this birthday problem. Write down your birthday month and day. If your class has very few people in it, also write down the birthdays of your family members. We will work together as a class to see if this “group” has any coinciding birthdays.]